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	Proposal # 2001-	A-205	(Office Us	e Only)

PSF	COVER Sheet (Attach to the front of each	h proposal)	The Influence of Flood Regimes, Vegetative
Conf	act Name: _ Ellen Mantalica		
Mail	ing Address: University of Californ	ia, Davis	95616
Tele	phone: (530) 754-9133		
Fax:	/ m a a b m a / a a / b		
Ema	il: mantalica@crocker.ucdavis.edu		
			_
Am	ount of funding requested: \$		
Son	ne entities charge different costs dependent	on the source	ee of the funds. If it is different for state or federal
fun	ds list below.		
Sta	te cost _ 2,341,090	Federa	alcost <u>2,521,236</u>
	st share partners?	Y	'es <u>χ</u> Nο
Ide	ntify partners and amount contributed by each	ch	
	1000		
Inc	licate the Topic for which you are applyi	ng (check o	nly one box).
风	Natural Flow Regimes		Beyond the Riparian Corridor
	Nonnative Invasive Species		Local Watershed Stewardship
			Environmental Education
			Special Status Species Surveys and Studies
	Shallow Water Tidal/ Marsh Habitat		
	Contaminants		Fish Screens
W	hat county or counties is the project located	in?sacı	ramento
W	□ Nonnative Invasive Species □ Local Watershed Stewardship □ Channel Dynamics/Sediment Transport · □ Environmental Education □ Flood Management □ Special Status Species Surveys and Studies □ Shallow Water Tidal/ Marsh Habitat □ Fishery Monitoring, Assessment and Research □ Contaminants □ Fish Screens What county or counties is the project located in? See attached lit and indicate number. Be as specific as possible □ st Stde Delta Tributaries Indicate the type of applicant (check only one box): □ State agency □ Federal agency □ Non-profit □ Local government/district □ Tribes ▼ University □ Private party		
po	ossible <u>st Side Delta</u> Tribut	aries	
In	dicate the type of applicant (check only one	box):	
	State agency		Federal agency
			~ ·
			*
æ	· ·		Private party
	Other:		

	icate the primary species which the proposal			Tour man
	San Joaquin and East-side Delta tributaries fal			
			Spring-run chinook salmon	
	Late-fall run chinook salmon		Fall-run chinook salmon	
	Delta smelt	<u> </u>	Longfin smelt	
	Splittail	Ξ.	'Steelhead trout	
	Green sturgeon .		Stripedbass	
	\mathcal{E}	. 🗅	r r	• •
	Waterfowl and Shorebirds		All anadromous salmonids	• ••
	Migratory birds		American shad	
	Other listed T/E species:			
т	1'			
	dicate the type of project (check only one box)		W-4	
10	Research/Monitoring		Watershed Planning Education	
	Pilot/Demo Project		Education	
	Full-scale Implementation '			
ls:	this a next-phase of an ongoing project?	Yes	?No Adds addit:	ional dimension to an
	ave you received funding from CALFED before?	Yes_		ing project
1 10	tve you received failuring from on the LD before.	. 0,5 _	<u> </u>	ing project
If v	es, list project title and CALFED number #99-N06	"Linke	ed Hydrogeomorphic-Ecosy	stem Models to Suppor
Adapt	ive Management: Cosumnes-Mokelumne Pai	ired Ba	asin Project"; #2000-F08	"McCormack-Williamso
	ave you received funding from CVPIA before?		No v Tract R	estoration Planning,
	are you reconventanting from ever in the follow	100	Design	and Monitoring Progra
lf	yes, list CVPIA program providing funding, project titl	le and C	VPIA number (if applicable):	
	, oo, mee e e e marpieg, ama promaning, amaaning, projectim		т п т п п п п п п п п п п п п п п п п п	
B [,]	y signing below, the applicant declares the follow	/ing:		
	The truthfulness of all representations in their	•	al;	

- The individual signing the form is entitled to submit the application on behalf of the applicant (if the applicant is an entity or organization); and
- The person submitting the application has read and understood the conflict d interest and confidentiality discussion in the PSP (Section 2.4) and waives any and ail rights to privacy and confidentiality of the proposal on behalf of the applicant, to the extent as provided in the Section.

Dr. J.F. Ouinn Printed name of applicant

Signature of applicant

BERKELEY . DAVIS . IRVINE . LOS ANGELES . RIVERSIDE . SAN DIECO . SAN FRANCISCO



SANTA BARBARA · SANTA CRUZ

Office of the Vice Chancellor for Research 410 Mrak Hall, One Shields Avenue Davis, California 95616.8671 Telephone: 530.752.6839 Facsimile: 530.752.5432

E-Mail: ffyee@ucdavis.edu

11 May 2000

CALFED Bay-Delta Program Office 1416 Ninth Street, Suite 1155 Sacramento, California 95814

Dear Colleague:

Proposal in Support of Project Entitled

"The Influence of Flood Regimes, Vegetative and Geomorphic Structures on the Links Between Aquatic and Terrestrial Systems: Applications to CALFED Restoration and Watershed Monitoring Strategies"

Principal Investigator - James F. Quinn

It is a pleasure to present for your consideration the referenced proposal in response to your 2001 Proposal Solicitation for the Ecosystem Restoration Projects and Programs.

Following the direction of "Attachment D - Terms and Conditions for State Proposition 204 Funds," this is to provide notification that University of California takes exception to the following proposed "standard clauses:

Section 6 - Substitution
Section 9 - Rights in Data
Section 11 - Indemnification, and
Standard Clauses - Insurance Requirements - DWR

In order to bring the above provisions into conformity with the University of California policy, we reserve the right to discuss with the aim of properly modifying these sections, should this proposal result in a subsequent award.

Please contact the principal investigator for scientific information. Administrative questions may be directed to me by telephone, facsimile or electronic mail at the numbers cited above. Furthermore, correspondence pertaining to this proposal and any subsequent award should be sent to the Office of the Vice Chancellor for Research and to the principal investigator.

Sincerely,

Contracts and Grants Analyst

Enclosures

c: J.F. Quinn

hand Use Checklist

All applicants must fill **out** *this* Land Use Checklist for their proposal. Applications must contain answers to the following questions to be responsive and to be considered for funding. *Failure to answer these questions and include them with the application will result in the application being considered nonresponsive and not considered-forfunding;*

1.	DO the actions in the proposal invol- or restrictions in land use (i.e. conse			
			X	
	YES		NO	
2.	If NO to # 1, explain what type of ac	ctions are involved in the	proposal (i.e., research only, plan	nning only).
	Research and field work	only.		
3.	If YES to # 1, what is the proposed	land use change or restri	ction under the proposal?	
4.	If YES to # 1, is the land currently	under a Williamson Act o	contract?	
	YES		NO '	
5.	If YES to # 1, answer the following	:		
	Current land use			
	Current zoning Current general plan designation			
6.	If YES to #1, is the land classified a Department of Conservation Impor		land of Statewide Importance or	Unique Farmland on the
	YES	NO	DON'T KNOW	
7.	If YES to# 1, how many acres of la	and will be subject to phy	sical change or land use restriction	ons under the proposal?
8.	If YES to # 1, is the property curre	ntly being commercially	farmed or grazed?	
	YES		NO	
9.	If YES to #8, what are		employeeslacreer of employees	
			1	

10.	Will the applicant acquire any interest in land under the proposal (fe	e title or a conservation easement)?
		X_
	YES	NO
11.	What entity/organization will hold the interest?	
12.	If YES to # 10, answer the following:	
	Total number of cores to be acquired under proposal	·
	Total number of acres to be acquired under proposal Number of acres to be acquired in fee	
	Number of acres to be subject to conservation easement	
	Ü	
13.	For all proposals involving physical changes to the land or restriction will:	n in land use, describe'what entity or organization
	manage the property	
	provide operations and maintenance services	
	conduct monitoring	
14.	For land acquisitions (fee title or easements), will existing water right	ats also be acquired?
	YES	NO
15.	Does the applicant propose any modifications to the water right or c	change in the delivery of the water?
	YES	NO
16	If YES to # 15, describe	
10.	1 125 to 11 19, describe	
		:

Environmental Compliance Checklist

All applicants must fill out this Environmental Compliance Checklist. Applications must contain answers to the following questions to be responsive and to beconsidered for funding. Failure to answer these questions and include them with the application will result in the application being considered nonresponsive and not considered for funding.

1.	Do any of the actions included in the proposal require compliance with either the California Environmental Quality Act (CEQA), the National Environmental Policy Act (NEPA), or both?
	$\frac{X}{NO}$
2.	If you answered yes to # 1, identify the lead governmental agency for CEQA/NEPA compliance.
	Lead Agency
3. Tł	If you answered no to # 1, explain why CEQA/NEPA compliance is not required for the actions in the proposal. here is no construction only field work and research.
4.	If CEQANEPA compliance is required, describe how the project will comply with either or both of these laws. Describe where the project is in the compliance process and the expected date of completion.
5.	Will the applicant require access across public or private property that the applicant does not own to accomplish the activities in the proposal?
	YES NO

If yes, the applicant must attach written permission for access from the relevant property owner(s). Failure to include written permission for access may result in disqualification of the proposal during the review process. Research and monitoring field projects for which specific field locations have not been identified will be required to provide access needs and permission for access with 30 days of notification of approval.

				7" •
6.	Please indicate what permits or other boxes that apply.	r approvals may	be required for the activities contained in your'pr	oposal. Check all
	LOCAL			
	Conditional use permit	-		
	Variance			
	Subdivision Map Act approval	_		
	Grading permit	_		
	General plan amendment			
	Specific plan approval			
	Rezone			
	Williamson Act Contract			
	cancellation			
	Other (please specify)			
	None required	_		
	STATE			
	CESA Compliance		(CDFG)	
	Streambed alteration permit		(CDFG)	

(RWQCB)

(USFWS)

(ACOE)

(ACOE)

(DPC, BCDC)

(Coastal Commission/BCDC)

DPC =Delta Protection Commission CWA = Clean Water Act CESA = California Endangered Species Act USFWS = U.S. Fish and Wildlife Service ACOE = U.S. Army Corps of Engineers

CWA § 401 certification

(please specify)

Notification Other ____

None required

ESA Consultation

CWA § 404 permit

None required

(please specify)

FEDERAL

Other_

Coastal development permit

Reclamation Board approval

Rivers & Harbors Act permit

ESA = Endangered Species Act
CDFG = California Department of Fish and Game
RWQCB = Regional Water Quality Control Board
BCDC= Bay Conservation and Development Comm.

The influence of flood regimes, vegetative and geomorphic structures on the links between aquatic and terrestrial systems: Applications to CALFED restoration and watershed monitoring strategies

Dr. James F. Quinn Department of Environmental Science and Policy University of California, Davis Davis, CA 95616

phone: 530-752-8027 fax: 530-752-3055 ifquinn@ucdavis.edu

Dr. Graham Fogg, Land, Air, and Water Resources, UCD

Dr. Mary Power, Integrative Biology, UC Berkeley

Dr. Mark Schwartz, Department of Environmental Science and Policy, UCD Dr. Edwin Grosholz, Department of Environmental Science and Policy, UCD

Dr. Nadav Nur, Point Reyes Bird Observatory

Dr. Kyaw Tha Paw U, Atmospheric Science, UCD

Dr. William E. Rainey, Integrative Biology, UC Berkeley

Type of organization and tax status:

Institution of higher education / tax exempt Tax identification number: 94-6036494-W

Executive Summary:

It is estimated that less than 5% of the Central Valley's original riparian forest remain intact, and floodplain wetlands have been similarly impacted by channel modification, agriculture and urbanization. The only cost-effective method for large scale restoration of floodplain communities is structural modification, such as levee breaches or levee setbacks, followed by natural succession of flood dependent biotas. For reasons that have been insufficiently studied, however, past structural restoration efforts have not been uniformly successful either in generating high quality, productive native-dominated vegetation or in re-establishing functioning food webs supporting the sentinel species (e.g. salmonids in the water, cuckoos in the trees) that marked the floodplains originally. Depending upon location, land use history, and physical environment, hanges in soil, groundwater supply, adjacent land use, or seed supply may prevent the formation of productive stands of native forest required by other species, or non-native species may dominate regenerating vegetation. Similarly, predators, timing of flooding, nutrient and detritus supplies, and exotic competitors may completely alter the composition and productivity of aquatic foodwebs that feed fish, birds, and bats.

In this study, a multi-disciplinary team of biologists from three institutions proposes to join forces with the Nature Conservancy (TNC) and a larger group of University of California hydrologists, geomorphologists, and watershed scientists (already funded by CALFED and others) to examine floodplain dynamics in the Cosumnes watershed. We will use a unified sampling design in floodplain areas newly subjected to flooding by levee breaches and other flow restoration efforts by TNC and neighboring landowners to examine conditions under which ecological succession is effective in restoring the structure and foodweb dynamics characteristic of functioning native ecosystems. With high resolution GIS modeling and field verification, we will both use standard methods of vegetational structure analysis and develop remote-sensing technologies to assess the impacts of flood regime, groundwater relations, soil, land use, and propagule supply on the establishment of riparian forest structure. Conversely, vegetation modifies groundwater flows and retention of water in the floodplain, and we will assess the feedback between ecology and floodplain hydrology.

We also propose to adapt flow and water quality models developed in the existing project, coupled with field trapping, nutrient and isotope assays, and structural analyses, to predict primary productivity of floodwater plankton and periphyton, production of zooplankton and aquatic insects, and their importance in coupling aquatic and terrestrial communities. This effort will be closely coupled with existing studies of floodplain fish populations, which depend upon the same resources.

Finally, we will conduct intensive surveys of populations and feeding of riparian birds and bats. These taxa have been chosen as indicators for a number of reasons. All bats and most of the riparian bird species targeted by the Riparian Habitat Joint Venture and related rare species monitoring efforts are insectivorous and highly dependent upon properly functioning aquatic and floodplain foodwebs. They in fact represent more effective wide-scale samplers of arthropod productivity than do the local traps of biologists, and may better indicate the effects of non-native predators, such as starlings, cowbirds, feral cats, and rats). They also depend upon suitable habitat structure for perching, nesting, and forage. As a result, recovering populations may be considered a necessary, if not sufficient, condition to conclude that riparian restoration has been successful.

As with the existing CALFED study in the Cosumnes, a major objective of this effort is to develop standard methods, training materials, software, and technical support capacity that may be applied widely within the CALFED region to assess the success of restoration and to inform adaptive management. In particular, we believe that the vegetation assessment and bird and bat monitoring methods will be widely adaptable by watershed groups and other non-specialists collaborators. The more intensive flow, nutrient, groundwater, and productivity analyses proposed may only be possible in a few locations used by large teams of experts, but they provide calibration and validation for the less intensive and more extensive methods.

Project Description:

Problem: Habitat restoration on a watershed scale depends on successful regeneration of natural species following structural changes in channels, levees, floodplains, and flow regimes. It is clear from past experience, particularly in the ambitious and well-studied levee setback projects in the Cosumnes River floodplain, that success in re-establishing native vegetation, animal species and productivity, varies with soil, sediment transport, groundwater processes, land-use history, timing of flooding, and supply of seeds in ways that are complex and not completely understood. This proposal builds upon a 20-year history of restoration in the Cosumnes floodplain, in which large areas have been restored to high-value riparian and wetland functions (e.g., as "accidental forest") following restoration of more natural flood regimes - with other extensive areas where both "accidental" and purposeful restoration have been much less successful. We draw on existing intensive hydrological and geomorphological studies in the floodplain for a better description of geophysical processes that are available than in most of the CALFED region. We will use these ecological studies to derive predictors of restoration "success", as defined by food web processes, development of natural vegetation structure, low relative abundance of invasive species, and intact communities as indicated by presence and breeding success of native riparian and floodplain birds and bats. The studies are designed to provide indicators of, and a mechanistic basis for, predicting success of floodplain restoration throughout the CALFED region. We will evaluate and refine best-practice monitoring and adaptive management tools for levee setbacks and other innovative floodplain management initiatives, and produce handbooks, information systems, and decision support tools that may be used for longterm floodplain management.

Conceptual Model: Functioning restored floodplain biotas depend on both vegetation structure and ecological coupling of the aquatic and terrestrial communities, which all depend upon discharge regimes and channel and floodplain morphologies (Fig. 1). Hydrologic regimes affect floodplain productivity and transfer of energy and nutrients among habitats (river channel-floodplain-riparian). (Fig 2). Floodplain spillover may initiate different aquatic community succession processes, depending upon timing, intensity, and seasonal supplies of organic matter, nutrients, fish and invertebrate predators, and residence times. Lower trophic levels on floodplains (primary producers) and primary consumers (herbivores and detritivores) differ in their vulnerabilities and nutritional values to fish and other vertebrate predators (Fig. 4). Structural development depends on substrate properties, including depositional vs. erosional environments, seed banks and other properties of land use history, flood dynamics, and depth to groundwater – all of which are modified by the growing vegetation. "Success" in re-establishing both foodwebs and structure require not only increases in biomass and productivity, but a structure and composition representing mostly native (vs. invasive) species. Published theory has been unconvincing in predicting invasion risk in California floodplains, and mechanistic monitoring will help delineate conditions naturally limiting invasions. In the same way salmonids act as effective integrators of aquatic community functioning, high trophic-level riparian vertebrates (birds and bats) represent attractive indicators of floodplain, wetland, and riparian function. They measure both trophic coupling between aquatic and terrestrial communities (e.g., through use of aquatic insects and crustaceans also used by indicator fish) and depend upon vegetation structure for shelter, foraging and reproduction. They are also easily sampled and thus are potential "success" indicators for other sites with less physical process information available than in the Cosumnes. This study will provide methods and a mechanistic basis for interpreting vertebrate dynamics in other projects.

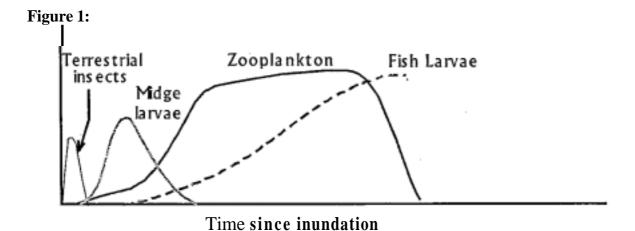
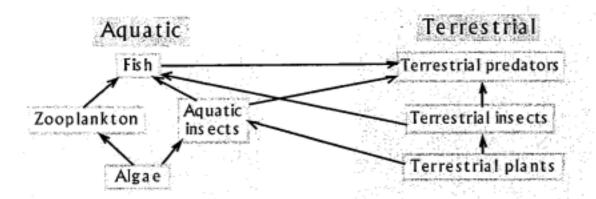


Figure 2



Key Questions: This project will address the following questions.

TABLE 1	Key Questions:
Task I Floodplain Restoration Success Criteria and Monitoring	Can potential riparian restoration areas be identified using physical factors?
	Is semi-passive restoration (breaching levee's, returning natural flood regime) more effective then active restoration (planting trees, intensive management)?
TASK 2 - Groundwater Vegetation Interactions	Is ET from riparian vegetation a major component of the hydrologic budget and can it play a substantial role in ground water recharge and streamflow?
	Do different communities and age classes of vegetation have different impacts on ground water?
	Does the availability of groundwater for summer flows and ET effect the success of riparian restoration?.
TASK 3 -Linking Aquatic and Terrestrial Systems	
Linking Aquatic and Terrestrial Systems	What factors determine the amount and fraction of insect production that emerges?
	What factors influence the fate of this emergence? (consumption by birds, odonates, bats; or return to the aquatic web (Fig. 4b)?
	How do floodplain forest structures influence the abundanc and collective foraging rates of birds and bats?
	How do inputs from riparian forests and their structure influence aquatic food webs?
Primary producers	What is the time course of algal community development following spillover?
	Do algal assemblages shift from edible to less edible over the course of succession?
	Is the time course of these changes affected by light or nutrients?
	What residence times (of water on the floodplain) and light or nutrient regimes best support edible algae?
Primary consumers:	How does floodplain management (timing and duration of inundation, floodplain geomorphology and vegetative stmcture, season and temperature regimes,) influence secondary production of these prey,
a ranca y consumers.	What is the relative contributions to this production by insects versus cmstacean zooplankton?
	Which consumer groups better support native (and non-native) fish?
<i>Task 4:</i> Bird populations as indicators of ecosystem health	To what extent do structure and food supply predict bird population dynamics as indicators of riparian condition?

The proposed project addresses the following CALFED goals, scientific uncertainty and CVPIA issues.

Table 2	CALFED Goals/Scientific Uncertainty	CVPIA - All Tasks
Task1 Floodplain Restoration Success Criteria and Monitoring TASK2-Groundwater Vegetation Interactions	Natural Flow Regime, Ripairan Vegetation, Floodplain Management, Non-Native Invasive Species Natural Flow Regime, Ripairan Vegetation, Floodplain Management	Habitats addressed: Riparian, Wetlands, and Aquatic Habitats Section 3406 a, b and Section 3402 - a, b
TASK 3 -Linking Aquatic and Terrestrial Systems	Natural Flow Regime, Decline in Aquatic Productivity, Non-native Invasive Species, Floodplain Management	Tasks address CVPIA goals of restoration and enhancement of fish, wildlifew and associated habitats
Task 4: Bird populations as indicators of ecosystem health	Floodplain Management, Non-native Invasive Species	

TASK 1: Floodplain Restoration Success Criteria and Monitoring

CVPIA has identified Central Valley riparian areas as a habitat impacted by the operation of the Central Valley Project and needing restoration. The Cosumnes River Preserve is using two different approaches to restoration of the riparian zone and floodplain ecosystem. One method is a planting trees directly. Active restoration provides some control over the composition of incipient forests, but is labor-intensive and bypasses natural successional processes. The other is a semi-passive approach of breaching levees and returning the "natural" fluvial processes to the floodplain. Levee breaches and setbacks can cover large areas and emulate natural floodplain processes, but there is no guarantee that re-vegetation will favor native species or restore a desirable mix of habitat structures. In practice, both have generated high productivity cottonwood-oak forest in some locations in the Cosumnes floodplain, and resulted in cocklebuns and stunted trees in others. Conditions resulting in productive gallery forests dominated by native trees have not been systematically examined, but appear to include flood regime, depth to groundwater, depositional zones and seed sources.

We propose a systematic, GIS based, evaluation of conditions associated with past restoration success at a 10m grid scale. Inundation characteristics will be taken from a combination of hydrological model results, DEMs, and aerial imagery of flood events developed by CALFED project 99-NO6. Depositional vs. erosional environments and particle size structures will be identified by using field techniques and model results from 99-NO6, augmented by existing soil maps as appropriate. Depth to groundwater will be taken from Task 2, and nutrient environment from Task 3. Seed banks for dominant vegetation species will be assayed by standard methods. Potential seed supply will be estimated by distance and direction to existing or known recent stands of critical species. Each of these attributes, will be ground-truthed along transects using standard ecological methods (Sawyer and Keeler-Wolf, 1995, Ralph et al. 1993). In the first year, the predicted values in the GIS grids will be tested and refined by standard regression techniques, and prepared for input into the models described below.

Sites identified by a quasi-additive GIS model (upgraded CARES, supported by project 99-NO6,) as suitable for riparian vegetation will be assessed for stem density, stand age, cover, DBH of canopy dominants, etc. Fit to the predictions will be evaluated on the ground using standard on-the-ground gradsect methods (see Sawyer and Keeler-Wolf 1995, Elzinga et al. 1998). Using the same methods, riparian vegetation structure will also be monitored at existing restoration sites to evaluate

the effectiveness of different restoration methods. However, over the course of the project, we expect to develop complementary methods for evaluating structure and composition from methods (laser altimetry, hyperspectral imaging) we are exploring in other watersheds under different funding.

Evaluating the structural differences between vegetation restored using "natural", semi-passive and active techniques will help evaluate conditions under which each is effective for restoration. Investigating the connection between the physical processes in the semi-passive approach and riparian regeneration will help set criteria for predicting and assessing success of restoration projects as well as refining our ability to prioritize areas for potential restoration. CALFED's goal of rehabilitation of natural processes will be addressed through this research by examining what physical factors influence the regeneration of riparian areas. Understanding how community structure is influenced by restoration methods will help set success criteria used in adaptive management plans for riparian restoration.

TASK 2: Groundwater and Vegetation Interaction

Scientific uncertainty about the interplay between riparian vegetation and groundwater recharge is a substantial obstacle to restoration efforts. Groundwater is a limiting factor for a wide range of organisms in the riparian ecosystem. On the Cosumnes River in particular, groundwater recharge drives the low-flow portion of the natural flow regime. Groundwater depletion causes the river to dry up in the late summer and early fall, thereby impacting the fall run salmon and other aquatic organisms. Shallow groundwater also controls riparian tree establishment (*Rood et al.*, 1998).

Unraveling this complex interaction between groundwater and riparian zone processes requires measurement and modeling of the hydrologic balance, both surface and subsurface, for local reaches of the riparian corridor. Though feasible and critically important for watershed management, such an effort has not been undertaken for any California riparian systems, and apparently very little for similar systems outside of California. UCD is currently constructing a linked surface-waterigroundwater model incorporating existing information on soils, topography, vegetation, land use/land cover and geologic features. An essential element of this model is the unknown evapotranspiration(ET) rate from riparian vegetation. Data on evapotranspiration and infiltration for the relevant species (*Quercus lobata* and *Populus fremontii*) varies in space and time in the riparian zone and is not available in the scientific literature. This proposed study will provide essential data for improving reliability of the watershed models.

The different water-balance components along river reaches in all three forest successional stages will be monitored and quantified. We will use two different methods to calculate riparian ET. First, riparian ET will be calculated as a residual term of the water-balance equation for a given river reach:

$$\int_{t_0}^{t} ET_{ripotrion} dt = \int_{t_0}^{t} (Q_{in} - Q_{out} + R) dt + \Delta S$$
 (1)

where Q_{in} is the volumetric inflow into the river reach between time t_0 and t, Q_{out} the volumetric outflow from the reach, R the volumetric flux between the river and the underlying aquifer and AS the change in storage within the river reach between t_0 and t. Second, measured values of riparian ET will be checked against the direct ET measurements.

To measure Q_{in} and Q_{out} , stage gauges will be installed at the beginning and end of the river reaches. A stage-discharge relationship will be determined by means of river gauging over a wide spectrum of flow conditions. Propeller type current meters and ultra sonic doppler flow meters are used for the flow measurements. A network of groundwater monitoring piezometers in four to five transects per river reach will be installed in the adjacent floodplain/riparian zone to determine hydraulic

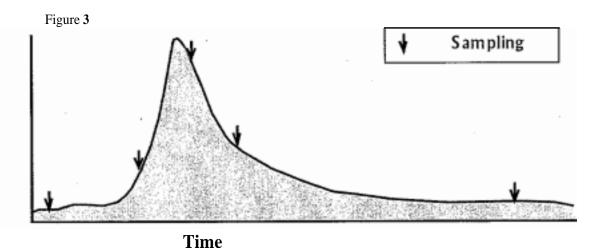
gradients between the river and the alluvial aquifer. Seepage meter measurements in the channel and seepage flux estimates based on thermal gradients between river water and ground water (Taniguchi 1993, Constantz and Thomas 1997) will be used to check the accuracy of these calculations.

Direct micrometeorological estimates of ET will be made with the use of eddy-covariance and gradient-mass budget methods. The complete budget equations involve exchange caused by both mean flows and the turbulent component of flows.

We plan to carry out intensive measurements for representative periods during different seasons, of both turbulent and mean fluxes of equation (2). Wind velocity in all three axes and temperature will be measured with three-dimensional sonic anemometers at high frequencies (10-20 Hz) to sample these variables for turbulent variations. Turbulent humidity variations will be measured by open path Infrared Gas Analyzers (IRGAs), while mean humidity will be measured with a dew point hygrometer and a pump drawing samples from a grid coordinated with the temperature sensors. Temperature will be measured with radiation-shielded, fan- aspirated sensors oriented in a vertical and horizontal grid centered in the riparian vegetation zone.

TASK 3: Linking Aquatic and Terrestrial Systems

We propose to investigate key linkages between the Consumnes restored floodplain and riparian habitats and compare these with linkages between river channel and similar riparian zones. We will determine how inundation regime influences the relative strengths of these linkages by following floods over a three-year period in an event-driven sampling program (Fig. 3). We will quantify energetic links from aquatic to terrestrial habitats including aquatic insects and fishes that subsidize or support terrestrial predators as well as inputs from terrestrial to aquatic habitats, including terrestrial insects, leaf fall, and detritus. We will consider physical linkages including the influence of soil inundation on terrestrial plants and the effect of this vegetation on light penetration and temperature regimes in the aquatic habitat. We will conduct monitoring, mensurative and manipulative experiments described below in a paired design that will explicitly compare functioning and links with terrestrial habitats of restored floodplains vs. contained (leveed) river channels.



Linking Aquatic and Terrestrial Systems: Emergence of aquatic insects as winged adults makes this fraction of floodplain secondary production available to birds and odonates (by day) and bats (by night) (Fig. 4). Like insectivorous birds, bat prey consumption rates are high (25-100% of body

mass/night [Barclay et al.1991]) and large colonies harvest many kg of insects/night. Bats rely heavily on aquatic insect production and several species forage largely over open water (Herd, 1982).

We will use several standard trapping methods to estimate winged aquatic and terrestrial insect fluxes through various floodplain habitats (open water, near or among trees and macrophytes). With stable isotope tracers, we will characterize transfer of energy through the food web and to the terrestrial system (Vander Zanden et al. 1999). Acoustic bat detectors and infrared visual counts will be used in open and forested floodplain habitats to measure foraging activity, habitat use, and density of acoustically distinguishable species. We will coordinate insect and bat sampling temporally and spatially, using the bird sampling spatial grid and sampling regimen (see below). We will also monitor the extent and timing of leaf fall, leaf decomposition rates, terrestrial insects and other inputs from forests in aquatic systems. We will also experimentally exclude shredders from litter bags (leaf decomposition) to quantify their effects on decomposition rates. Analyses are outlined in Table 1.

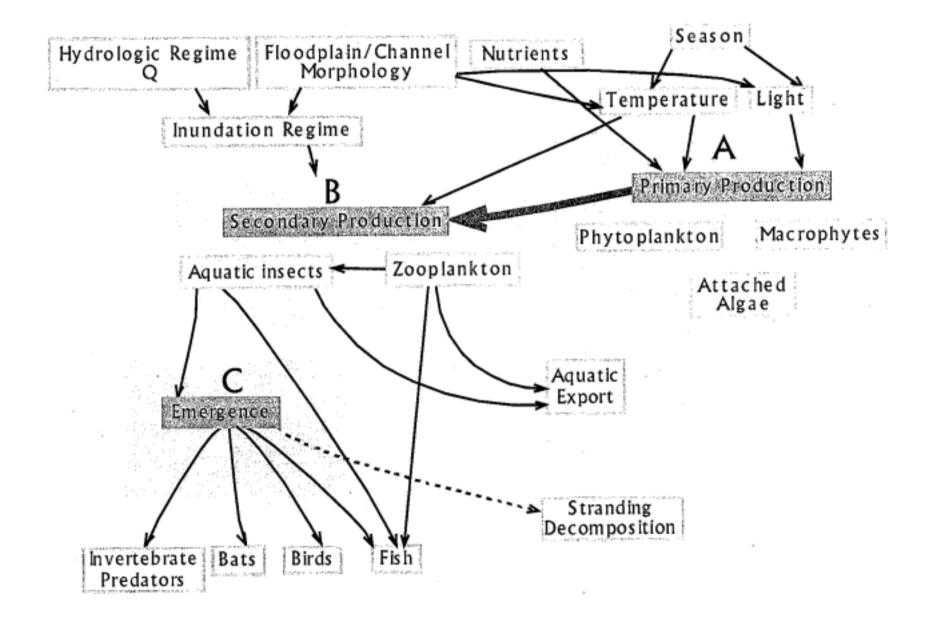
Primaryproducers: Primary production on inundated floodplains includes phytoplankton (free-floating algae), periphyton (attached algae), and macrophytes (Figure 4a). With both phytoplankton and attached algae, more edible, fast growing taxa predominate early in succession (i.e. within weeks of inundation), and are replaced over time by less edible taxa (Sommer 1985, 1986; Power 1995, 1996). Algal succession toward less edible taxa may be accelerated in more productive environments with higher nutrient fluxes or irradiation. In summary, our predictions, based on observations in other systems (Power 1992, 1995; Moss, 1995, 1996) is that high nutrients and long residence times of floodplain water will promote phytoplankton or floating macrophytes; long residence times with lower nutrient inputs will favor rooted macrophytes; shorter residence times will favor attached algae as chief sources of local primary productivity. Table 1 lists analyses on the succession of primary producers.

We will collect, quantify, and identify taxa in samples of periphyton, phytoplankton, and macrophytes in various floodplain and river sites over the course of the flooded season following standard methods (A.P.H.A. 1995). We will also measure essential fatty acids and elemental nutrient ratios (C:P, C:N) in phytoplankton, periphyton, macrophyte, and plant detritus samples as indicators of their food quality for consumers following published methods (Kattner and Fricke 1986, Solorzono and Sharp 1980). We will investigate shading effects from trees using experimental shade cloth roofs and nutrient effects via experimental nutrient diffusing substrates or diluted incubations. We will experimentally exclude invertebrate from periphyton supporting substrates to measure their grazing impacts and investigate zooplankton and insect growth on algae diets to infer edibility.

Primary consumers Aquatic herbivore-detritivore grazers are essential links in food webs that govern the amount of algal production that is converted to terrestrial consumers (Figure 4b). In floodplain ecosystems, we expect these assemblages to be dominated by rapidly colonizing, fast growing populations of insects and zooplankton. It is not obvious which group should dominate at various times after spillover, or under regimes with short water residence on floodplains. Because grazer abundances may be strongly affected by predation (Vander Zanden, unpub.), floodplain features (rooted or floating vegetation) that provide refuges for invertebrates can have major effects on their dynamics. During a spring 2000 flood observed on the Cosumnes, chironomids initially colonized following spillover, but within weeks were replaced, first by cladocerans then copepods, whose densities then fell as larval carp increased (Moyle et al., Vander Zanden, Grosholz, unpubl., See Fig 1).

We will collect zooplankton and insects using standard methods in different habitats (macrophyte beds, floodplain forest, and agroplain) during the flood cycle. We will coordinate these sampling efforts with those of the ongoing fish research, looking at fish growth, abundance, and stomach contents. We will use Cesium isotope methods to characterize the bioenergetic budgets of

Figure 4



fishes among habitats (Rowan & Rasmussen 1996). We will measure polyunsaturated fatty acids as diet biomarkers in zooplankton, insect, and vertebrate consumers (Leveille et al. 1997, Arts and Wainman, 1999). We will conduct feeding trials to detect differences in growth and reproduction rates of invertebrates on various diets and experimentally exclude fishes from floodplain habitats to determine their impact on invertebrate abundances (Mueller-Solger, 1999).

TASK 4 Bird Populations as indicators of ecosystem health

Use of riparian habitat for feeding and successful breeding of a suite of rare riparian-associated bird species is both an accepted indicator of riparian health, and a principal purpose of many riparian restoration efforts (Griggs and Small ms, Nur, et al, in press). The state strategy for protecting these species is described in the Riparian Conservation Plan of the Riparian Habitat. Joint Venture (www.prbo.org/CPIF/Consplan.html). In our study, birds, like bats, require both appropriate habitat structure and high arthropod productivity and, in fact, "sample" both over large areas, and thus are particularly appropriate indicators of restoration "success." Birds probably also better indicate the overall impact of non-native species (invasive plants and predators, including starlings, cowbirds, feral cats, and rats) than do other measures. Bird monitoring by the investigators in the Cosumnes goes back for over a decade, and the same protocols are in widespread use in the CALFED region. Bird monitoring thus gives us time-series information and an indication of spatial applicability unavailable for most other environmental attributes studied in the various projects in the watershed. Methods of bird monitoring are also inexpensive and require less specialized training than most of our other methods, and should therefore be applicable for success assessment for most other riparian restoration projects.

Objectives of the bird study component are:

- 1. To assess species richness, diversity, abundance and distribution of select species as a function of both habitat structure and energetics
- 2. To assess primary demographic parameters for select species, specifically adult survival, reproductive success (and its components) and dispersal of juveniles and adults.
- 3. To relate demographic parameters to predator activity
- 4. To relate information on reproductive success to prey availability (insect abundance and identity)
- 5. To assess recolonization of newly restored riparian habitat.

These objectives will be achieved through a three-part monitoring plan. We will'assessspecies richness and species diversity of the riparian bird community at several sites on the Cosumnes River. This will be done using standard point count surveys (Ralph et al. 1993), a technique that PRBO has used in the Central Valley since 1993(e.g., Geupel et al. 1996, Nur et al. in press b). In addition, point count surveys will be used to assess relative abundance (Ralph et al. 1993) of a suite of riparian species and to determine their distributions across the Cosumnes study region, within and between patches of habitat. Initial abundance and demographic study will focus on the 14 species identified in the Riparian Conservation Plan. Demographic parameters measuring fecundity, juvenile survival, adult survival, and dispersal will then be related to ultimate factors such as prey availability, predator activity, and flooding events, using standard population models.

Data from constant-effort mist-netting provides information on adult survival and fraction of transients in the captures, both of which are obtained from capture-recapture analyses of mistnet captures (Nur et al. 1999, Nur in press b). In addition, capture-recapture analyses can be used to construct an index of juvenile survival, and using the "multi-state" approach of Nichols et al. (1992), can be used to infer dispersal rates between sites. Finally, information on captures of juveniles is used to construct a productivity index (Nur et al. 1993), which will supplement the information obtained

from monitoring breeding attempts (Level 3, below). Constant-effort mist-netting has been conducted since 1995 at the Cosumnes Preserve by PRBO; we propose to continue this mist-netting and add additional mist-netting sites, as part of this project.

The methods and results of the bird monitoring effort explicitly tie consensus statewide assessment strategies to success in riparian restoration. In conjunction with the other studies in this proposal and the existing CALFED project, they provide calibration and validation unavailable elsewhere. An important deliverable of the study will be handbooks, software, and help materials to assist watershed groups and others to develop bird-based assessments in other riparian and floodplain projects.

Adaptive Management:

After analyzing the structure and composition of restored riparian areas we will be able to evaluate the success of restoration methods. We will also be able to further refine the criteria used for selection of restoration sites. The results from the groundwater vegetation interaction experiments will add to our understanding of how restoration of riparian areas can affect local groundwater and how local groundwater conditions can affect the success of riparian restoration. Data on ET rates will help refine hydrologic models from UC Davis CalFed project 99-N06. After we have sampled the time trajectories of primary producers, invertebrate primary consumers, and responses by predators over 3 to 6 different floods, we will revise and improve our hypotheses about how the timing, duration, and spatial extent of floods, and the vegetative and geomorphic structures of the floodplain, combine to influence food web dynamics in the restored floodplain and trophic transfers to terrestrial habitats. Our event-driven monitoring of primary producers and primary consumers on the Cosumnes floodplain (Fig. 3), and coordinated observations of responses by vertebrate predators to these prey, should evoke further hypotheses as well as experimental tests of factors that limit and regulate transfers of energy and nutrients within and between aquatic and terrestrial habitats following inundation or dewatering (e.g., Fig. 5 =Jake's time graph of terrestrial insects, midges, zp, and fish with his interpretation of density limiting factors for each). The long term goal is to understand floodplain food web dynamics in enough detail so that we can modify flood regimes and habitat structures to divert as much energy as possible towards desirable higher trophic levels (native vertebrates) and away from non-native consumers, or lower trophic levels that, if left unchecked, have the potential to explode as pest or nuisance populations.

Proposed scope of work:

Location: Sacramento County, Lower Cosumnes Floodplain, East Side Delta Tributaries Ecological Zone. See attached map 1. More detailed information and a GIS coverage of the study site is available upon request.

Monitoring and Assessment plans:

This project is a demonstration of monitoring methods for terrestrial and aquatic ecosystems. The methods and results of this analysis will be added into the monitoring plan produced as part of UC Davis CalFed project 99-NO6. In addition a report of monitoring biotic systems will be produced.

TASK 5: Data Handling and Storage: Data will be handled by ICE incorporating data collected into the GIS and databases currently being developed as part of the UC Davis CalFed project 99-NO6. Results, reports and appropriate data will be made available through the Cosumnes Research Group website www.ice.ucdavis.edu/Cosumnes. Project coordination, quarterly reports and general project management will be handled ask part of task 5.

Expected Products/ Outcomes Work Schedule Start and completion dates

Deliverables	Schedule
-	Start date 1-Jan-01
Task 1 Floodplain Restoration Success Criteria and Monitoring	
Report: Monitoring plan for riparian vegetation	1-Oct-03
Report: Analysis of 3 restoration methods	1-Oct-03
Program: Initiation of long term monitoring program of riparian restoration efforts and vegetation regeneration in the Lower Cosumnes River Watershed to determine the effects of restoration methods and flood regime.	1-Oct-03
TASK 2 - Groundwater Vegetation Interactions	
Report: Analysis of evapotranspiration in the three major forest types	1-Mar-03
Report: Analysis of hydrologic budget in 3 riparian reaches	3/1/03
Report: Analysis of management implications of future riparian restoration projects	1-Jul-03
Program: Initiation of a long term monitoring program to determine changes in ET with changes in the ecological community through succession and changing groundwater conditions	1-Jul-03
TASK 3 -Linking Aquatic and Terrestrial Systems	
Report: Analysis of linkages between Aquatic and Terrestrial Systems	1-Jul-03
Report: Primary production in floodplain and river sites	1-Jul-03
Report: Primary consumers in the floodplain and river sites	1-Jul-03
Report: Trophic pathways in floodplain and river sites	1-Jul-03
Program: Development of a long term monitoring program to analyze links between aquatic and terrestiral systems in the floodplain and river channel.	1-Jul-03
Task 4: Bird populations as indicators of ecosystem health	30-Dec-03
Report: Bird species diversity, distribution and success	30-Dec-03
Report: Analysis of metapopulation model	30-Dec-03
Program: Continuation of a long term monitoring program using birds as indicators of riparian ecosystem health.	30-Dec-03
Task 5: Data Management Report: Integration of project data into existing Cosumnes GIS, databases and webpage	30-Dec-03

Feasibility:

The research team working on this project has extensive experience with the methods discussed and the referenced in the project description. The team will be using proven research methods to address issues of scientific uncertainty associated with watershed level restoration. The researchers are internationally known in their fields and have experience directing large collaborative research projects.

The proposed research will be undertaken on the Cosumnes River Preserve. The Watershed Center has been collaborating with the Preserve on other research and will continue this partnership. As a University research group our mandate is to develop and disseminate information and to provide knowledge-based services and decision support to decision makers throughout the state. The data and techniques we develop will not be proprietary and will be available to interested groups over the web. In addition the University is well situated to facilitate communication between agencies and create a standard format for data presentation.

ERP Goals and CVPIA Priorities: CALFEDs areas of scientific uncertainty that this project addresses are the effect of natural flow regimes on ecosystems, declines in aquatic productivity, nonnative invasive species, channel dynamics, sediment transport and riparian vegetation, floodplain management as an ecosystem tool. The Cosumnes River Watershed offers a unique opportunity to study the effects of natural flow regimes on a large watershed because there are no large water projects in the basin. It also benefits from a long history of floodplain restoration and monitoring efforts by the Nature Conservancy and collaborators. The proposed project addresses how the natural flow regimes flood cycles, time, frequency and duration can impact the different levels of the floodplain food web, the response of the riparian tree regeneration and the impact of trees on the groundwater. Studying the natural flow regime effects on the floodplain ecosystem will help resource managers plan flow variability in other areas of the Bay-Delta watershed that will enhance the ecosystem and positively impact the native species populations. A key component to riparian restoration is the interaction between natural flow regimes, groundwater and vegetation. Restoration of riparian vegetation is dependent on appropriate groundwater depths. These depths change with the natural flow regimes recharge of groundwater and the extraction by humans and trees. Understanding how these components interact is critical for successful riparian restoration.

This project builds on the modeling of the abiotic system funded by CALFED grant 99-N06. Understanding how the sources of fish and bird food react to flood regimes will greatly improve our ability to design effective adaptive management plans. This study will help determine if the physical system is returned to a "natural" state will the biotic system be restored or will management be require to generate a ecosystem dominated by native species.

The second area of scientific uncertainty that is addressed is the decline in productivity. By analyzing productivity and the food web in both the floodplain and the river channel it will be possible to identify the contribution of restored floodplains can make to the productivity of the ecosystem. Analyzing the food web will also increase our understanding about how the management of flow regime can affect productivity and how we can use that to target native species.

The third area of concern is non-native invasive species. The impact of flow regime and productivity on non-native as well as natives will be analyzed. We will also examine the conditions under which infestations of invasives, and the impact of non-native on native species in'restored and natural habitats.

Relationship to Other Ecosystem Restoration Projects:

This project is closely linked to other restoration programs in the Eastside Delta Tributaries Ecological Zone. The University of California, Davis is a partner in the multi-agency effort to restore

and protect the Cosumnes River Ecosystem. The Watershed Research Group (WRG) is an integral part of this effort. UCFWS's Andromous Fish Restoraiton Program and the Packard foundation, CALFED grant 99-NO6 and CALFED Project # 2000-F08 provided earlier funding for the WRG. This CALFED funding would allow us to expand an on going comprehensive monitoring and focused research project on the Cosumnes. This project will complement the existing program by integrating more of the biotic elements of concern for CALFED. This project aims to facilitate communication, provide easy access for stakeholders, and avoid duplication of research efforts.

Previous Recipients of CALFED or CVPIA funding:

Project Title: "Linked hydrogeomorphic-ecosystem models to support adaptive management:

Cosumnes-Mokelumne Paired Basin Project." Project Number CALFED Project 99-NO6

Project Status: The project was selected in August 1999 and received funding in January 2000. This 3-year grant supports a multidisciplinary, linked physical-biological monitoring and assessment project in the Cosumnes and Mokelumne basins. The project is developing baseline studies, targeted research and new analytical tools and information systems to support resource management and restoration design and planning in these two watersheds; and what is learned in this project will have potential applicability throughout the CALFED arena.

Project Title: "McCormack-Williamson Tract Restoration Planning,

Design and Monitoring Program"

Project Number: CALFED Project # 2000-F08

Project Status: The project was selected for funding by CALFED in February. We are awaiting the receipt of draft contracting documents from the US Fish & Wildlife Service, and hope to begin work in July. This 2-year grant will support research on the historic hydrogeomorphic conditions of the tract, which is necessary for restoration planning, and will put in place the baseline studies, that are necessary for development of an on-going monitoring program. CALFED is funding restoration design at McCormack-Williamson via a separate grant to the Department of Water Resources.

System-Wide Ecosystem Benefits: This is a system-wide synergistic project. The WRG seeks to create an integrated watershed level research and monitoring program. By creating a demonstration project on the Cosumnes we are hoping to inform restoration efforts throughout the Bay-Delta watershed. The increased understanding of the effects of flood regime and groundwater on food webs and vegetation will help direct future restoration efforts in the Bay-Delta watershed. The models and monitoring protocol that we create will be broadly applicable and the baseline data that we collect on the Cosumnes can be used in comparison studies of restoration and other stressors throughout the Bay-Delta watershed. The data that we collect and the models that we create will all be made available o the public on the web and through workshops and meetings with agencies and stakeholders

Qualifications:

James F. Ouinn has degrees from Harvard (A.B. Biology, 1973) and the University of Washington (PhD, Zoology, 1979). He joined the faculty of the University of Pennsylvania in 1979, and moved to the UC at Davis in 1981, where he is now a full professor. He has worked on habitat fragmentation on species diversity and extinction risk, strategies for inventory and monitoring studies, the design of systems of nature reserves, and estimation of demographic rates for fisheries management, and is the author of more than 60 scholarly publications. Dr. Quinn also directs in the Information Center for the Environment (ICE) at UC Davis. Under his direction, the ICE has developed has developed an extensive internet accessible database and GIS data catalog of CA watershed information, and the principal biodiversity databases for US. National Parks, UNESCO Biosphere Reserves worldwide and a variety of public and private lands in California. ICE works closely with over 20 public agencies on monitoring information, databases, and Web services (http://ice.ucdavis.edu) involving biodiversity, water quality, and land use, both in California and internationally.

Mary E. Power is Professor of Integrative Biology at the UC, Berkeley. She received her B.A. from Brown University, her M.S. from the Boston University Marine Program in Woods Hole, and her Ph.D. in Zoology from the University of Washington. Her research interests focus on food webs in temperate and tropical rivers. She is currently investigating the effects of primary productivity, disturbance (by flooding), lack of disturbance and species invasions on food web structure and dynamics in northern California rivers. Recently, her group has expanded their efforts to study the influence of river-derived insect production on terrestrial consumers (spiders, lizards, bats) in watersheds and ecosystem - level processes that they mediate. She has served as Chair of the Aquatic Ecology Section of the Ecological Society of America, as a group leader for a Presidential Western Water Policy Advisory Commission, and on the Scientific Advisory Boards for the National Center for Ecological Analysis and Synthesis. She currently sits on the Scientific Advisory Board for the Institute for Ecosystem Studies and the Board of Directors for the California Nature Conservancy.

Graham E. Fogg is Professor of Hydrogeology at the UC, Davis in the Hydrology Program of the Dept. of Land, Air and Water Resources (LAWR). He received his B.S. in Hydrology from University of New Hampshire, his M.S. in Hydrology from University of Arizona, and his Ph.D. in Geology from The University of Texas at Austin. He was initially hired as an Associate Professor at UC Davis in 1989. Dr. Fogg's research interests are in stochastic imaging of subsurface complexity, analysis of contaminant transport in heterogeneous porous media, groundwater and surface water interaction, and thermal processes in groundwater. He has 37 refereed articles, edited 1 book and 28 refereed reports of international distribution. He has researched alluvial fan aquifer heterogeneity as related to groundwater flow and transport processes in the Cosumnes, American, and Kings River watersheds in CA. and studied groundwater and surface water interaction in the Putah Creek, Cosumnes and Upper Truckee watersheds. He has served as Vice Chair for Hydrology in the Department LAWR and as Chair of the Hydrologic Sciences Graduate Group.

Mark W. Schwartz is an associate professor at UC, Davis. He received a MA in ecology from the University of Minnesota in 1985 and a PhD in biology from Florida State University in 1990. Dr. Schwartz has conducted research on the effects of disturbance and global change on forest and grassland vegetation in Florida, Illinois, and California. In particular, he has developed experience in forest dynamic models through a demographic monitoring survey of a streamside forest in northern Florida, now in its 12" year. Much of this research on vegetation dynamics has focused on the role of fire as an agent of disturbance in altering vegetation dynamic processes. Dr. Schwartz has supervised 2 postdoctoral associates and 10 graduate students at UCD. He has also successfully managed over 15

grants from both state and federal granting agencies. He has edited a book on conservation in fragmented landscapes, is co-author of a textbook on plant Ecology and has published 28 refereed articles and 26 technical reports, book reviews and proceedings contributions.

Edwin Grosholz is an Assistant Specialist in Cooperative Extension in the Department of Environmental Science and Policy at UC Davis. He received his Ph.D. in Zoology from UC Berkeley in 1990. He has been a post-doctoral fellow at the University of Washington, the Smithsonian Institute and UC Davis, and most recently an Assistant Professor at University of New Hampshire. Dr. Grosholz research emphasizes the ecological and evolutionary impacts of introduced aquatic invertebrates. He has broad experience in evaluating the impacts of introduced species as stressors in estuarine communities and their role in altering trophic structure. He has been a PI or CO-PI on more than a dozen federally funded grants and has published over 20 refereed articles and book chapters.

Nadav Nur received a Ph.D. in Zoology from Duke University in 1981 and an MS in Biostatistics from the University of Washington in 1991. He was Alexander von Humboldt Research Fellow, at the University of Tübingen from 1986-1987. From 1989 to the present Dr. Nur has been the quantitative and population ecologist for the Point Reyes Bird Observatory. In January 2000 he became the Directory of Population Ecology at PRBO. He is also an adjunct professor at San Francisco State University since 1998. Dr. Nur's research interests focus on population modeling, quantitative ecology and statistical analysis of seabirds, landbirds and marine mammals. He has been a PI or co-PI on over 13 grants from federal, state and private funding sources. He has an extensive publishing history in bird population dynamics, survey techniques and monitoring.

Kyaw Tha Paw U is a Professor of Atmospheric Science at UC, Davis, and a Biometeorologist at the California Agricultural Experiment Station. He was awarded a B.S. from the Massachusetts Institute of Technology, in Earth and Planetary Sciences; and a M.S., M.Phil., and Ph.D. from Yale University, in Biometeorology. His research interests have encompassed biometeorological interactions between plants and the atmosphere. Specifically, he studies turbulent exchange processes within and above plant canopies, using both numerical modeling and experimental techniques. His research group has projects, which include measuring, with state-of-the-art sonic anemometers, the carbon, water, and energy exchanges and turbulence within and above a forest in southern Washington as part of the AmeriFlux carbon network. He is the Editor-in-Chief of the journal, Agricultural and Forest Meteorology. He has been Chair of the Biometeorology and Aerobiology Scientific and Technical Advisory Committee of the American Meteorological Society (AMS).

<u>William E. Rainey</u> is an associate specialist, in the Dept. of Integrative Biology, UC, Berkeley. He received a BS in Geology from Michigan State University (1969) and a Ph.D. in Zoology from UC Berkeley (1984). Dr. Rainey's research has focused on landscape effects, on food web structure and vertebrate distribution, as well as conservation biology and phylogeography with an emphasis on bats. He has extensive experience with bat population monitoring and food web interactions in temperate and tropical areas. Dr. Rainey has also PI or Co-PI grants from federal and state granting agencies.

COST: (see attached budgets for State and Federal funding)

The total cost of the project is \$2,341,090 with a state overhead rate of 10% or 2,521,236 with a federal overhead rate of 26%. The State and Federal budgets are found in Tables 2 and 3. All of the Tasks in the proposal are linked, but can be stand-alone projects and can be funded separately or in phases if needed. This budget includes two subcontracts one for Mary Power's research group at UC Berkeley and the other for the Point Reyes Bird Observatory. The overhead rates are standard, UC Davis overhead is charged on direct costs and depend on the source of funding. Project management will be handled as part of the data management and storage task.

Budget Justification: The salaries and fee remissions are standard for UC Davis. Benefits range from 23% for non-student positions, 9.2% for graduate student positions, and 1.7% for undergraduate positions. Task 1 equipment costs will cover field data logger. Subtask 2a will require equipment for piezometer installation, monitoring and stream gauging. Subtask 2b will need sonic anemometers, IRGAs, temperature sensors, hygrometer, net radiometer, heat flux plates, solar cell panels and regulators, a computer and a generator. This will allow the researchers to set up a detailed system of sampling groundwater and ET. The equipment costs for task 2 have been spread across years 1 and 2. Task 3 equipment requests will cover a dissecting scope, -80C freezer for samples, and a replacement inverted microscope. Task 5 equipment covers a data entry station and storage media.

Supply costs for all Tasks cover replacement parts for equipment, analysis of samples, software, office supplies, field supplies, storage materials and misc. supplies.

Local Involvement

The Nature Conservancy provides the principal local outreach for projects planned or underway at the Preserve, and the University regularly participates with TNC personnel in meetings, briefings and other consultations with local agency representatives and landowners.

The Cosumnes River Task Force (CRTF), a coordinating body chaired by Sacramento County Supervisor Don Nottoli, was consulted in the development of the original research and monitoring plan for the lower Cosumnes and has been kept advised of its progress. The CRTF comprises the Resource Conservation Districts and Reclamation districts from the North Delta to Rancho Murieta, the Farm Bureau, and major landowners, including the Nature Conservancy. Its goal is to coordinate watershed planning for the Cosumnes, and it is serving as one of the key stakeholder forums for development of the Cosumnes River Feasibility Study by ACOE. By participating with the Conservancy in CRTF meetings, briefings and other activities we are seeking to assure close coordination of this program with CRTF plans and objectives.

In addition, through the Conservancy we are in continuing contact with the local agencies, landowners and representatives of stakeholder groups participating in CALFED's North Delta Task Force and the Mokelumne-Cosumnes Watershed Alliance. Participation in these forums serves to keep key constituencies informed of research activities and provides the vehicle for further involvement by those who seek it.

Finally, the Cosumnes River Preserve is itself a partnership, which includes the Bureau of Land Management, Department of Fish and Game, Department of Water Resources, Ducks Unlimited and Sacramento County Parks and Recreation. Out of existing grant funds we have created a Field Coordinator position expressly for the purpose of assuring close coordination of university field studies with the activities of the partner organizations and Preserve neighbors.

									Year 1	
Task5 - Data Management	Tank A DDDO Died Comme	Subtask3b-UCD - Aquatic	Subtask3a-UCB	Task 3- Aquatic and Terrestrial Linkages	Subtask2b ET analysis	Subtask2a Hydrologic Analysis	Task2 - Groundwater Vegetation Interactions			STATE FUNDING
45.85/hr, PGRIV:2112hrs :\$16.5/hr		RA:2640hrs:\$1 3.5/hr, PGR 1:1584hrs:\$14. 55/hr, PGRII:2112hrs: \$15.2/h, PGRVI:528hrs: \$18.1/hr, UG:888hrs:\$8.2 5/hr			RA:2640hrs:\$1 3.5/hr	RA:1320hrs:\$1 3.5/hr, PGRVI:2112hrs :\$18.1/hr	ation Interactions	Analyst II:1320hrs:\$22/ hr,UG:528hrs:\$ 8.25/hr	Direct Labor Hours	
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	STATE FUNDING		Subject to Overhead Exempt fro						m Overhead				
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	Task2 - Groundwater Vegeta	RA:1320hrs:\$1											
	Subtask2a Hydrologic Analysis	4.1/hr, PGRVI:2112hrs :\$18.9/hr	58529	1089:	4500	2000		7592.197		4314	87828.1641		
-	Subtask2b ET analysis	PGRIV:2640hrs :\$17.2/hr	45408	4177.5	2000			6158.554		18622	86366.0896		
	Task3- Aquatic and Terrestri Subtask3a-UCB	lal Linkages					173,310	6500			179,810		
	Subtask3b-UCD -Aquatic and Terrestrial	RA:2640hrs:\$1 4.1/hr, PGR 1:1584hrs:\$15. 15/hr, PGRII:2112hrs: \$15.8/h, PGRVI:528hrs: \$18.9/hr, UG:888hrs:\$8.7 5/hr	1234(19046	3000	15500	173,310	14988.68		18622	183497.447		
	Task4 - PRBO Bird Survey!						75255	6500			8175٤		
	Task5 - Data Management	Admin:276hrs:\$ 52.5/hr, PGRIV:2112hrs :\$17.2/hr	50816	10818	1200		707650	6533.4771		40467	71868.249:		
	Total for 3 years		877647	152336	32600	119505	737270.11	157208.81	139850	124674	2,341,090		

				-			-																		Year 1	
Task5 - Data Management	Surveys	Task4 - PRBO Bird	Terrestrial	Aguatic and								Subtask3a-UCB	Terrestrial Linkages	Task1- Aquatic and	allalysis	OUDBASK2D E1	Cubination CT	Hydrologic Analysis	Subtask2a		Task2 - Groundwate	Success Criteria	Task1 - Restoration		Task	Federal Funding
85/hr, PGRIV:2112hrs:\$1 6.5/hr	Admin:276hrs:\$45.		br	UG-888hrs:\$8.25/	PGRVI:528hrs:\$18	5.2/h,	PGRII:2112hrs:\$1	ìr,	1:1584hrs:\$14.55/	hr, PGR	RA-2640hre-\$13.5/					KA:2590nrs.\$13.5/	0.00406-0406	8 1/hr	hr, PGRVI:2112hrs:\$1	RA:1320hrs:\$13.5/	Task2 - Groundwater Vegetation Interactions	hr .	UG:528hrs:\$8.25/	Analyst	Direct Labor Hours	
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		Analyst II:1320hrs:\$23.5/hr									
		,UG:528hrs:\$8.50/ hr	35508	7211	1000	6000		12926.913			62645.80
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	analysis	6.85/hr	40458	3722.14	2000	10000		5618.0136	30500	18622	110920.1
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	Task3- Aquatic and Terrestrial Linkages					-					
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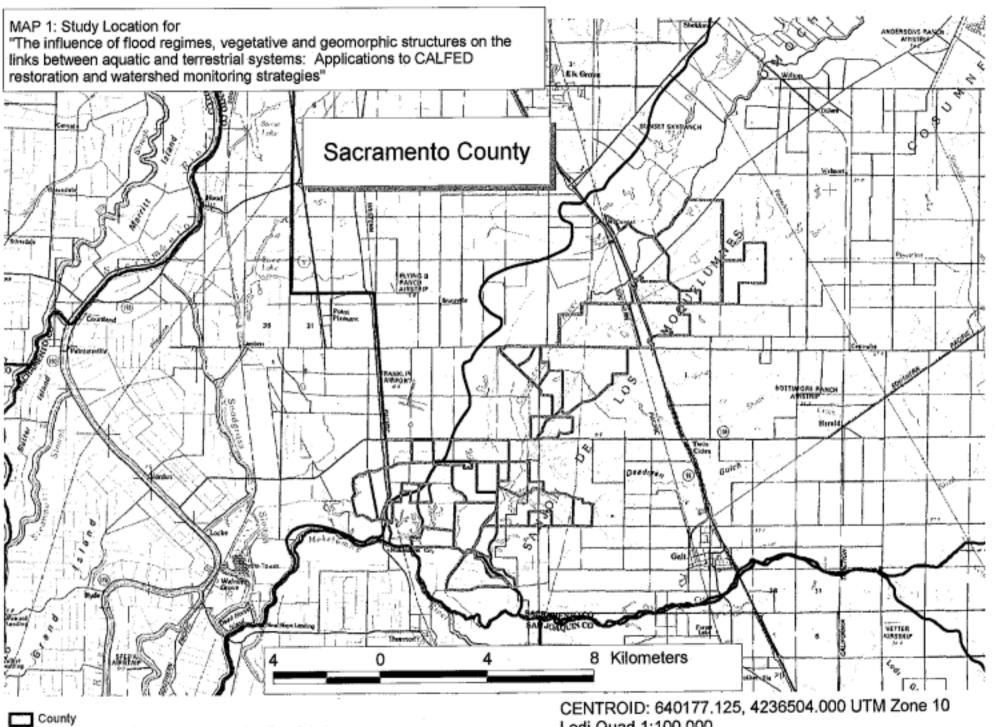
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Total for 3 years	Management	Task5 - Data			Surveys	Task4 - PRBO Bird	Terrestrial	Aquatic and	Subtask3b-UCD -						Subrasksa-UCB	Task3- Aquatic and	analysis	Subtask2b E1	Analysis	Subtask2a			-	Criteri la	Task1 - Reston atio		X X	Sederal Suadiag
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County
Cosumnes River Preserve boundary - location of study
CALWATER Planning Watersheds: 653111000, 654400000, 551000000

Lodi Quad 1:100,000 Information Center for the Environment, UCD

Data Provided by: Teale Data Center, TNC and CDF

APPLICATION FEDERAL AS:			2 DATE SUBMITT		Application Identifier	
			May 15, 200		Ctata Application Ident	
1. TYPE OF SUBMIS Application ☐ Construction	Preapplicati			BY FEDERAL AGENCY	State Application Ident	iller
☐ Non-Construct	· -	nstruction	4. DATE NECEIVED	DI I EDENALACI	recerancentine	
5. APPLICATION INF	ORMATION				<u> </u>	
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	unty. state, and zip w		ıa			be contacted on matters
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University of Ca				Administrative Co	ontact Te	chnical Contact
410 Mrak Hall	, 20110			Fay Yee -530-752-20	075 Dr. J a	ames Quinn752-8027
Davis, CA 95616	6 YC	DLO COL	JNTY	ffyee@uco	davis.edu jtq	uinn@ucdavis.edu
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13. PROPOSED PR			IĞRESSIONAL DISTI	RICTSOF	h Droinet	
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Jan. 2001	Jan. 2004	1 431 	mr. obc		DISC. 11	m. rombo
15. ESTIMATED FU						IVE ORDER 12372 PROCESS?
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OMB Approval No. 0348-0043

OMB Approval No. 0348-0044

2 Ballion State		. SECT	ION A - BUDGET SUN	MARY		, , , ,
	og of Federal tic Assistance			New or Revised Budget		
	lumber (b)	Federal (C)	Non-Federal	Federal (e)	Non-Federal	Total (g)
'Watershed Center	\$		\$	\$ 2,521,236	\$	\$
2.				,		
3.						
4.						
5. Totals	\$		\$	\$	\$	 \$
为数据 41 3e		SECTIO	N B - BUDGET CATE			
6. Object Class Categories	_	GRANT PROGRAM, FUNCTION OR ACTIVITY				Total
) year 1	(2) year 2	(3) year 3	(4) Te	(5)
a. Personnel	\$	280,258	292,477	304,912	Φ	877.697
b. Fringe Benefits		48,916	50,770	52,650		152,336
c. Travel		9200	11,700	11,700		32,600
d. Equipment		100,650	39,200	0		139,850
e. Supplies		46,505	37,000	36,000		119,505
f. Contractual		245,155	243,549	248,565		737,270
g. Construction						
h. Other Fee Remission	on 4	41,558	41,558	41,558		124,674
i. Total Direct Charges (so	um of 6a-6h)	772,243	716,255	695,385		2,183,882
j. Indirect Charges		113,069	105.917	118,368	10	337,354
k. TOTALS (sum of 6i and 6j)		885,311	\$ 822,172	* 813,752	\$	\$ 2,521,236
The state of the s	and against the engine		,			
7. Program Income	\$		\$	\$	\$	\$:

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Standard Form 424A (Rev. 7-97) Prescribed by OMB Circular A-102

And a second	SECTION	C - NON-FEDERAL RE	SOURCES	part of the second second	
(a) Grant Program		(b) Applicant	(c) State	(d) Other Sources	. (e) TOTALS
8.		\$	\$	\$	\$
9.					
10.					
11.			<u> </u>		
12. TOTAL (sum of lines 8-11)		\$	\$	\$	\$
	SECTION	D - FORECASTED CA	SH NEEDS	named the straight	
	Total for 1st Year	1st Quarter	2nd Quarter	3rd Quarter	4th Quarter
13. Federal	\$	\$	\$	\$	\$
14. Non-Federal					
15. TOTAL (sumoflines 13 and 14)	\$	\$	\$	\$	\$
SECTION E - BUDGET ESTIMATES OF FEDERAL FUNDS NEEDED FOR BALANCE OF THE PROJECT					4-7-37-12
(a) Grant Program		FUTURE FUNDING PERIODS (Years)			
		(b) First	(c) Second	(d) Third	(e) Fourth
16.		\$	\$	\$	\$
17.					·
18.					
19.		·			
20. TOTAL (sum of lines 16-19)		\$	\$	\$	\$
lastic or an arms	SECTION F	- OTHER BUDGET INF	5 The 1 To 1 To 1 To 1 Land Land		0.50
21. Direct Charges: 2,183,882 22. Indirect Charges: 26% overhead 337,354				1	
23. Remarks: Base for F&A rate is MT	DC				

ASSURANCES - NON-CONSTRUCTION PROGRAMS

Public reporting burden for this collection of information is estimated to average 15 minutes per response, including time for reviewing instructions. searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. Send comments regarding the burden estimate or any other aspect or this collection of information, including suggestions for reducing this burden, to the Office of Management and Budget, Paperwork Reduction Project (0348-0040), Washington, DC 20503.

PLEASE DO NOT RETURN YOUR COMPLETED FORM TO THE OFFICE OF MANAGEMENT AND BUDGET. SEND IT TO THE ADDRESS PROVIDED BY THE SPONSORING AGENCY.

NOTE: Certain of these assurances may not be applicable to your project or program. If you have questions, please contact the awarding agency. Further, certain Federalawarding agencies may require applicants **to** certify to additional assurances. **If** such is the case, you will be notified.

s the duly authorized representative of the applicant, I certify that the applicant:

- Has the legal authority to apply for Federal assistance and the institutional, managerial and financial capability (including funds sufficient to pay the non-Federal share of project cost) to ensure proper planning, management and completion of the project described in this application.
- 2. Will give the awarding agency, the Comptroller General of the United States and, if appropriate, the State, through any authorized representative, access to and the right to examine all records, books, papers, or documents related to the award; and will establish a proper accounting system in accordance with generally accepted accounting standards or agency directives.
- 3. Will establish safeguards to prohibit employees from using their positions for a purpose that constitutes or presents the appearance of personal or organizational conflict of interest, or personal gain.
- 4. Will initiate and complete the work within the applicable time frame after receipt of approval of the awarding agency.
- 5. Will comply with the Intergovernmental Personnel Act of 1970 (42 U.S.C. §§4728-4763) relating to prescribed standards for merit systems for programs funded under one of the 19 statutes or regulations specified in Appendix A of OPM's Standards for a Merit System of Personnel Administration (5 C.F.R. 900, Subpart F).
- 6. Will comply with all Federal statutes relating to nondiscrimination, These include but are not limited to: (a) Title VI of the Civil Rights Act of 1964 (P.L. 88-352) which prohibits discrimination on the basis of race, color or national origin; (b) Title IX of the Education Amendments of 1972, as amended (20 U.S.C.§§1681-1683, and 1685-1686), which prohibits discrimination on the basis of sex; (c) Section 504 of the Rehabilitation

- Act of 1973, as amended (29 U.S.C. 5794). which prohibits discrimination on the basis of handicaps; (d) the Age Discrimination Act of 1975, as amended (42 U.S.C: \$\frac{4}{2}6101-6107\), which prohibits discrimination on the basis of age; (e) the Drug Abuse Office and Treatment Act of 1972 (P.L. 92-255), as amended, relating to nondiscrimination on the basis of drug. abuse; (9 the Comprehensive Alcohol Abuse and Alcoholism Prevention, Treatment and Rehabilitation Act of 1970 (P.L. 91-616), as amended, relating to nondiscrimination on the basis of alcohol abuse or alcoholism; (g) §§523 and 527 of the Public Health Service Act of 1912 (42 U.S.C. §§290 dd-3 and 290 ee 3). as amended, relating to confidentiality of alcohol and drug abuse patient records; (h) Title VIII of the Civil 'Rights Act of 1968 (42 U.S.C. §§3601 et seq.), as amended, relating to nondiscrimination in the sale. rental or financing of housing: (i) any other nondiscrimination provisions in the specific statute(s) under which application for Federalassistance is being made; and. (i) the requirements of any other nondiscrimination statute(s) which may apply to the application.
- 7. Will comply, or has already complied, with the requirements of Titles II and III of the Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970 (P.L. 91-646) which provide for fair and equitable treatment of persons displaced or whose property'is acquired as a result of Federal or federally-assisted programs. These requirements apply to all interests in real properly acquired for project purposes regardless of Federal participation in purchases.
- 8. Will comply, as applicable, with provisions of the Hatch Act (5 U.S.C. §§1501-1508 and 7324-7328) which limit the political activities of employees whose principal employment activities are funded in whole or in part with Federal funds.

- Will comply, as applicable, with the provisions of the Davis-Bacon Act (40 U.S.C. §§276a to 276a-7), the Copeland Act (40 U.S.C. §276c and 18 U.S.C. §874), and the Contract Work Hours and Safety Standards Act (40 U.S.C. §§327-333), regarding labor standards for federally-assisted construction subagreements.
- 10. Will comply, if applicable, with flood insurance purchase requirements of Section 102(a) of the Flood Disaster Protection Act of 1973 (P.L. 93-234) which requires recipients in a special flood hazard area to participate in the program and to purchase flood insurance if the total cost of insurable construction and acquisition is \$10,000 or more.
- 11. Will comply with environmental standards which may be prescribed pursuant to the following: (a) institution of environmental quality control measures under the National Environmental Policy Act of 1969 (P.L. 91-190) and Executive Order (EO) 11514: (b) notification of violating facilities pursuant to EO 11738; (c) protection of wetlands pursuant to EO 11990; (d) evaluation of flood hazards in floodplains in accordance with EO 11988; (e) assurance of project consistency with the approved State management program developed under the Coastal Zone Management Act of 1972 (16 U.S.C. §§1451 et seq.); (f) conformity of Federal actions to State (Clean Air) Implementation Plans under Section 176(c) of the Clean Air Act of 1955. as amended (42 U.S.C. §§7401 et seq.); (g) protection of underground sources of drinking water under the Safe Drinking Water Act of 1974, as amended (P.L. 93-523); and, (h) protection of endangered species under the Endangered Species Act of 1973, as amended (P.L. 93-205).

- 12. Will comply with the Wild and Scenic Rivers Act of 1968 (16 U.S.C. §§1271 et seq.) related to protecting components or potential components of the national wild and scenic rivers system.
- 13. Will assist the awarding agency in assuring compliance with Section 106 of the National Historic Preselvation Act of 1966. as amended (16 U.S.C. \$470), EO 11593 (identification and protection of historic properties), and the Archaeological and Historic Preselvation Act of 1974 (16 U.S.C. §\$469a-1 et seq.).
- 14. **VM** comply with P.L **93-348** regarding **the** protection of human subjects involved in research, development, and related activities supported by this award of assistance.
- 15. Will comply with the Laboratory Animal Welfare Act of 1966 (P.L. 89-544, as amended, 7 U.S.C. §§2131 et seq.) pertaining to the care, handling, and treatment of warm blooded animals held for research, teaching, or other activities supported by this award of assistance.
- 16. Will **comply** with the Lead-Based Paint Poisoning Prevention Act (42 U.S.C. §§4801 et seq.) which prohibits the use of lead-based paint in construction or rehabilitation of residence structures.
- 17. Will cause to be performed the required financial and compliance audits in accordance with the Single Audit Act Amendments of 1996 and OMB Circular No. A-133, 'Audits of States, Local Governments, and Non-Profit Organizations."
- 18. **Will comply** with all applicable requirements of all other Federal laws, executive orders, regulations, and policies governing this program.

NATURE OF AUTHORIZED CERTIFYING OFFICIAL	TITLE Fay Yee Contract &		
LICANT ORGANIZATION		DATE SUBMITTED	
THE REGENTS OF THE UNIVERSITY. OF CALIFORNIA			MAY 1 5 2008

U.S. Department of the Interior

Certifications Regarding Debarment, Suspension and Other Responsibility Matters, **Drug-Free** Workplace Requirements and Lobbying

Persons signing this form should refer to the regulations referenced below for complete instructions:

Certification Regarding Debarment, Suspension, and Other Responsibility Matters - Primary Covered Transactions - The prespective primary participant further agrees by submitting this proposal that it will include the clause titled, "Certification Regarding Debarment, Suspension, Ineligibility and Voluntary Enclusion - Lower Tier Covered Transaction," provided by the department or agency entering into this covered transaction, without modification, in all lower tier covered transactions and in all solicitations for lower tier covered transactions. See below for language to be used; use this form for certification and sign; or use Department of the Interior Form 1954 (DI-1954). (See Appendix A of Subpart D of 43 CFR Part 12.)

Confication Regarding Debarment. Suspension, Ineligibility and Voluntary Exclusion - Lower Tier Covered Transactions - (See Appendix B of Subpart D of 43 CFR Part 12)

Certification Regarding Drug-Free Workplace Requirements-Hande I. (Grantees Other Than Individuals) and Alternate II. (Grantees Who are Individuals)- (See Appendix C of Subpart D of 43 CFR Part 12.)

Squature on this form provides for compliance with certification requirements under 43 CFR Parts 12 and 18. She certifications stell be treated as a material representation of fact upon which reliance will be placed when the Department of the Interior determines to award the covered transaction. grant. cooperative agreement or loan.

PARTA Certification Regarding Debarment, Suspension, and Other Responsibility Matters - Primary Covered Transactions

CHECK V IF THIS CERTIFICATION IS FORA PRIMARY COVERED TRANSACTION AND IS APPLICABLE.

- (1) The prospective primary participant certifies to the best of its knowledge and belief, that it and its principals:
 - (a) Are not presently detained, suspended, proposed for debarment, declared ineligible, or voluntarily excluded from covered transactions by any Federal department or agency:
 - (b) Have not within a three-year period preceding this proposal been convicted of or had a civil judgment rendered against them for commission of fraud or a criminal offense in connection with obtaining, attempting to obtain, or performing a public (Federal State or local transaction or contract under a public transaction; violation of Federal or State antitrust statutes or commission of embeddment, theft, forgery, bribery, falsification or destruction of records, making false statements, or receiving stolen property;
 - (c) Are not presently indicted for or otherwise criminally or civilly charged by a governmental entity (Federal, State or local) with commission of any of the offenses enumerated in paragraph (1)(b) of this certification; and
 - (d) Have not with a tree year period preceding this application/proposal had one or more public transactions (Federal, State or local) terminated for cause or default.
- (2) Where the prospective primary participant is unable to certify to any of the statements in this certification, such prospective participant shall attach an explanation to this proposal.

PARTB Certification Regarding Debarment, Suspension, **Ineligibility and** Voluntary Exclusion **Lower Tier** Covered Transactions

CHECK __ IF THIS CERTIFICATION IS FOR A LOWER TIER COVERED TRANSACTION AND IS APPLICABLE.

- (1) The prospective lower lear participant certifies, by submission of this proposal, that neither it nor its principals is presently debarred, suspended proposed for debarment, declared ineligible, or voluntarily excluded from participation in this transaction by any Federal department or agency.
- (2) Where the prospective lower tier participant is unable to certify to any of the statements in this certification, such prospective participant shall attach an explanation to this proposal.

DI-2010, March 1995 (This form consolidates DI-1953, DI-1954, DI-1955. DI-1956 and DI-1963) PARTC: Certification Regarding Drug-Free Workplace Requirements

CHECK _ IF THIS CERTIFICATION IS FOR AN APPLICANT WHO IS NOT AN INDIVIDUAL

Alternate I. (Grantees Other Than Individuals)

A The grantee certifies that it will or continue to provide a drug-free workplace by:

- (a) Publing a statement notifying employees that the unlawful manufacture. distribution. dispensing, possession. or use of a controlled substance is prohibited in the grantee's workplace and specifying the actions that will be taken against employees for violation of such prohibition:
- (b) Establishingan ongoing drug-free awareness program to inform employees about-

(1) The dangers of drug abuse in the workplace;

The grantee's policy of maintaining drug-free workplace;

(3) Any available drug counseling, rehabilitation, and employee assistance programs; and

- (4) The penalties that may be imposed upon employees for drug abuse violations occurring in the workplace:
- (c) Making to a requirement that each employee to be engaged in the performance of the grant be given a copy of the statement required by paragraph (a);
- (d) Notifying the employee in the statement required by paragraph (a) that, as a condition of employment under the grant. the employee will -

1) Abide by the terms of the statement; and

- (2) Notify the employer in writing of tis or her conviction for a violation of a criminal drug statute occurring in the workplace no later than five calendar days after such conviction:
- (e) Notifying the agency in writing, within ten calendar days after receiving notice under subparagraph (d)(2) from an employee or otherwise receiving actual notice of such conviction. Employers of convicted employees must provide notice, including position the to every g a t officer on whose grant activity the convicted employee was working, unless the Federal agency has designated a certial point for the receipt of such notices. Notice shall include the identification number(s) of each affected grant;
- (f) Taking one of the following actions, within 30 calendar days of receiving notice under subparagraph(d)(2), with respect to any employee who is so convicted --

(1) Taking appropriate personnel action against such an employee, up to and including termination, consistent with the

requirements of the Rehabilitation Act of 1973, as amended; or

- (2) Require such employee to participate satisfactorily in a drug abuse assistance or rehabilitation program approved for such purposes by a Federal, State, or local health, law enforcement, or other appropriate agency;
- (g) Miking a good faith of fort to continue to maintain a drug-free workplace through implementation of paragraphs (a), (b), (c), (d), (e) and (f).

B. The grades may insert in the space provided below the site(s) for the performance of work done in connection with the specific grant:
Place of Performance (Street address, city, county, state, zip code)
Check if there are workplaces on file that are not identified here.

PARTD: Certification Regarding Drug-Free Workplace Requirements

CHECK __ IF THIS CERTIFICATION IS FOR AN APPLICANT WHO IS AN INDIVIDUAL.

Alternate II. (Grantees Who Are Individuals)

- (a) The parties certifies that, as a condition of the grant, he or she will not engage in the unlawful manufacture, distribution, dispensing, possession, or use of a controlled substance in conducting any activity with the grant;
- (b) If convicted of a criminal drug of fense resulting from a violation occurring during the conduct of any grant activity, he or she will port the conviction in wring, within 10 calendar days of the conviction to the grant officer or other designant, unless the Federal agency designates a central point for the receipi of such notices. When notice is made to such a central point, it shall include the identification number(s) of each affected grant.

DI-20'10 March 1995 (This form consolidates DI-1953, DI-1954, DI-1955, DI-1956 and DI-1963) PARTE:

Certification Regarding Lobbying

Certification for Contracts, Grants, Loans, and Cooaerative Aareements

CHECK

IF CERTIFICATION IS FOR THE AWARD OF ANY OF SHE FOLLOWING AND THE AMOUNT EXCEEDS \$100,000: A FEDERAL GRANT OR COOPERATIVE AGREEMENT SUBCONTRACT, OR SUBGRANT UNDER SHE GRANT OR COOPERATIVE AGREEMENT."

CHECK__ IF CERTIFICATION S FOR THE AWARD OF A FEDERAL LOANEXCEEDING THE AMOUNT OF \$150,000, OR A SUBGRANT OR SUBCONTRACT EXCEEDING \$100,000, UNDER THE LOAN.

The undersigned certifies, to the best of his or her knowledge and belief. that:

- (1) No Federal appropriated funds have been paid or will be paid, by or on behalf of the undersigned, to any person for influencing or attention to influence and flow or employee of an agency, a Member of Congress, and officer or employee of Congress, or an employee of a Member of Congress in connection with the awarding of any Federal contract, the making of any Federal grant. the making of any Federal loan, the entering into of any cooperative agreement, and the extension, continuation, renewal. amendment, or modification of any Federal contract, grant, loan, or cooperative agreement.
- (2) If any furds other than Federal appropriated funds have been paid or will be paid to any person for influencing or attempting to influence an officer or employee of any agency, a Member of Congress, an officer or employee of a Member of Congress in connection with this Federal contract, grant, loan, or cooperative agreement, the undersigned shall complete and submit Standard Form-LLL. "Disclosure Form to Report Lobbying," in accordance with its instructions.
- (3) The undesigned shall require that the language of this certification be included in the award documents for all subawards at all field including subcontacts, subgrants, and contracts under grants, loans, and cooperative agreements) and that all subrecipients shall certify accordingly.

This certification is a material representation of fact upon which reliance was placed when this transaction was made or entered into. Submission of this certification is a presquisite for making or entering into this transaction imposed by Section 1352, title 31, U.S. Code. Any person who falls to file the required certification shall be subject to a civil penalty of not less than \$10,000 and not more than \$100,000 for each such failure.

As the authorized certifying official, I hereby certify that the above specified certifications are true.

SIGNATURE OF AUTHORIZ	ZED CERTIFYING OFFICIAL	<i>24WV</i> ∨ \		
TYPED NAME AND TITLE	Fay Yee Contract & Grant Analyst	[] ()	Υ	
DATE	MAY 1 5 2008			

DI-2010 March 1995

(This form consolidates DI-1953. DI-1954.

DI-1955, DI-1956 and DI-1963)

STATE OF CALIFORNIA

NONDISCRIMINATION COMPLIANCE STATEMENT

STD, 19 (REV. 3-95)

COMPANY NAME THE REGENTS OF THE UNIVERSITY OF CALIFORNIA
University of California, Davis Campus

The company named above (herinafter referred to as "prospective contractor") hereby certifies, unless specifically exempted, compliance with Government Code Section 12990 (a-f) and California Code of Regulations, Title 2, Division 4, Chapter 5 in matters relating to reporting requirements and the development, implementation and maintenance of a Nondiscrimination Program. Prospective contractor agrees not to unlawfully discriminate, harass or allow harassment against any employee or applicant for employment because of sex, race, color, ancestry, religious creed, national origin, physical disability (including HIV and AIDS), medical condition (cancer), age (over 40), marital status, denial of family care leave and denial of pregnancy disability leave.

CERTIFICATION

I, the official named below, hereby swear that I am duly authorized to legally bind the prospective contractor to the above described certification. I amfully aware that this certification, executed on the date and in the county below, is made under penalty of perjury under the laws of the State of California.

OFFICIAL'S NAME			
Fay	Yee		
DATEEXECUTED	MAY 1 5 2000	EXECUTED IN THE COUNTY OF YOLO	
PROSPECTIVE CONTRACTOR	R'SSIGNATURE		
PROSPECTIVE CONTRACTOR COTT	Tacts and Grants Analyst		
PROSPECTIVE CONTRACTOR	Ing Abdent	S OF THE UNIVERSITY OF CALIFORNIA	
	University	of California, Davis Campus	



Cosumnes River Preserve 13501 Franklin Bouleward Galt, California 95632

TEL 916 683-2142 FAX 916 683-1702

May 10,200

Dr. Jeffrey Mount
Director, Center for Integrated Watershed Science and Management
University of California, Davis
Davis. CA 95616

Dear Dr. Mount,

I am writing on behalf of The Nature Conservancy's Cosumnes River and Delta Project to express our support for the UCD Watershed Center's proposal to CALFED to develop a long-term aquatic terrestrial monitoring and assessment program in the Lower Cosumnes Watershed, and to grant the applicants continued access to the Cosumnes River Preserve for this program.

The program builds on the existing CALFED and Packard-funded research programs already underway at the Cosumnes River Preserve, and proposes to provide technical, analytical and informational tools to support adaptive management **of** terrestrial and aquatic systems in the Delta Habitat Corridor--- which is a priority area for both TNC and CALFED, and which provides critical habitat for priority species.

The proposal is unique in that it is long-term, it is comprehensive, builds on existing research occurring at the Preserve, and links aquatic, terrestrial and groundwater systems. It does not focus on a single species or stressor or process, but rather brings together expertise from many disciplines and adds additional biotic elements to existing research at the Preserve. This project will give us insight into floodplain management, restoration success criteria and groundwater-vegetation interactions, which can help with long-term adaptive management planning.

This comprehensive, multi-disciplinary approach is designed to yield results applicable to other Conservancy projects and to a wide array of restoration efforts in the Bay-Delta. The work that the Center proposes to do will support the Conservancy's stewardship responsibilities on the Cosumnes Preserve and is consistent with the Conservancy's commitment to disseminate the lessons learned from the practice of adaptive management on its ecologically critical holdings.

We look forward to participating in the expanded set of collaborative research opportunities that this project can bring to the Cosumnes watershed.

Sincerely,

Cosumnes River and Delta

Project Director

UNIVERSITY OF CALIFORNIA, DAVIS

BERKELEY . DAVIS . IRVINE . LOS ANGELES . RIVERSIDE . SAD DIEGO . SAD FRANCISCO



SANTA BARBARA . SANTA CRUZ

JOHN MUIR INSTITUTE OF THE ENVIRONMENT

ONE SHIELDS AVENUE DAVIS. CALIFORNIA 95616

May 11,2000

Delta Protection Commission 14215 River Road P.O. Box 530 Walnut Grove, CA 95690

Dear Commissioners.

The Center for Integrated Watershed Science and Management of the University of California, Davis, in cooperation with The Nature Conservancy's Cosumnes River and Delta Project, is applying for CALFED funds to add an important new project element to its multi-disciplinary restoration monitoring and assessment program in the Cosumnes watershed.

The existing program, which is funded by a combination of CALFED and Packard Foundation funds, is developing technical, analytical and informational tools and predictive models to support adaptive management in the lower Cosumnes basin. The program currently involves researchers in the fields of geology, hydrology, water quality and wildlife biology who are studying the linkages between river and floodplain physical systems and aquatic ecology. The new proposal will bring in researchers from other disciplines – such as food web ecology, avian ecology and riparian vegetation — in order to improve our understanding of the linkages among aquatic, terrestrial and groundwater systems.

This comprehensive, multidisciplinary approach will significantly advance our knowledge of river and floodplain ecosystems; and the project is designed to produce results that will support resource management and land use planning efforts of the county and stakeholders in the lower Cosumnes watershed, and inform restoration efforts in the Bay-Delta region as a whole.

The Center considers collaboration and communication essential to its mission of improving watershed science and management. We have an on-going collaborative arrangement with The Nature Conservancy and its partners at the Cosumnes Preserve (Bureau of Land Management, Department of Fish and Game, Department of Water Resources, Ducks Unlimited, Sacramento County Parks and Recreation). Through the Conservancy and the East Bay Municipal Utility District we are in continuing contact with a number of local agencies, landowners and representatives of stakeholder groups in the lower Cosumnes/Mokelumne basins, including CALFED's North Delta Task Force, the Cosumnes River Task Force and the Mokelumne-Cosumnes Watershed Alliance. We appreciate the guidance and cooperation we have received to date, and look forward to continuing to work closely with these and other regionaiorganizations.

A more detailed description of the proposed project is attached. If you have any questions, please contact me or Ellen Mantalica, Watershed Center Coordinator, at (530) 754-9133.

Sincerely,

Dr. Jeffrey Mount Director, Center for Integrated Watershed Science and Management BERKELEY + DAVIS + IRVINE + LOS ANGELES + REVERSIDE + SAN DIEGO + SAN FRANCISCO



SANTA BARBARA · SANTA CRUZ

JOHN MUIR INSTITUTE OF THE ENVIRONMENT

ONE SHIELDS AVENUE DAVIS. CALIFORNIA 95616

May 11, 2000

Sacramento County Planning Department County Administration Center 700 H Street, Room 1450 Sacramento, CA 95814

Dear Planning Department:

The Center for Integrated Watershed Science and Management of the University of California, Davis, in cooperation with The Nature Conservancy's Cosumnes River and Delta Project, is applying for CALFED funds to add an important new project element to its multi-disciplinary restoration monitoring and assessment program in the Cosumnes watershed.

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Sincerely,

Dr. Jeffrev Mount

Director, Center for Integrated Watershed

Science and Management

UNIVERSITY OF CALIFORNIA. DAVIS

BERKELEY . DAVIS . IRVINE . LOS ANGELES . RIVERSIDE . SAN DIEGO . SAN FRANCISCO



SANTA BARBARA . SANTA CRUZ

JOHN MUIR INSTITUTE OF THE ENVIRONMENT

ONE SHIELDS AVENUE DAVIS, CALIFORNIA 95616

May 11,2000

Clerk of the Board of Supervisors County of Sacramento 700 H Street, Room 1450 Sacramento, CA 95814

Dear Clerk of the Board:

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Dr. Jeffrey Mount

Director, Center for Integrated Watershed

Science and Management